

Investigating the Current Status of Collegiate Emergency Medical Services (EMS)
Organizations via a National Survey Study and Tracing the History of Arizona State

University EMS Department

by

Jada Wang

A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Science

Approved April 2019 by the
Graduate Supervisory Committee:

Matt Chew, Co-Chair
Jane Maienschein, Co-Chair
Karin Ellison
Alison Essary

ARIZONA STATE UNIVERSITY

May 2019

ABSTRACT

Emergency Medical Services (EMS) first response personnel treat urgent and immediate illnesses and injuries in prehospital settings, and transport patients to definitive care if needed. EMS originated during warfare. The practice of rescuing wounded soldiers started during the Byzantine Empire, and developed along with other medical advances to the present day. Civilian EMS in the United States grew rapidly starting in the 1960s. Following the landmark National Research Council white paper of “Accidental Death and Disability: The Neglected Disease of Modern Society”, the nation addressed the key issues and problems faced in delivering emergency medical services. Today, colleges and universities often sponsor EMS organizations to serve populations concentrated in complex campuses. These are collectively known as Collegiate-Based Emergency Medical Services (CBEMS). By September 2018, there were 252 registered CBEMS organizations in the United States. Most are affiliated with the National Collegiate Emergency Medical Services Foundation (NCEMSF), which advocates, encourages, and provides support for CBEMS organizations. A survey repeating prior work (1996 and 2005) was sent to all NCEMSF registered CBEMS organizations, and 24 responded. The survey included questions on demographics, response capacities, coverage, organization, and logistics information. Locally, Arizona State University Student Emergency Medical Services (SEMS at ASU) began as an all-student-run volunteer organization in 2008. In 2018, SEMS at ASU became ASU EMS, as an official subdivision of the ASU Environmental Health Safety (EH&S) Department. This study summarizes the history of EMS, investigates the current status of CBEMS organizations and traces the history of ASU EMS from a volunteer group to an official department.

DEDICATION

To my mama,
a woman who is focused and unimpressed,
who taught me the value of integrity and hard work,
who taught me the power of kindness and concern for others,
who taught me what it means to have a pure heart,
who taught me what it means to have a lion heart,
and who has always held me to the highest standards.

I love you, mama.

ACKNOWLEDGMENTS

I would like to thank my thesis advisor Dr. Matt Chew at Arizona State University. He has provided unfailing support and continuous encouragement since the beginning, and has never once doubted my abilities.

I would also like to thank my committee co-chair Dr. Jane Maienschein, who has demonstrated what it means to be a ball of fire. She is truly an inspiration for all women in science.

Finally, I would like to express my gratitude to my other committee members, Dr. Karin Ellison and Dr. Alison Essary, who are the most helpful and caring professors. I am lucky to have them.

I sincerely thank those who have been by my side throughout my years of study at Arizona State University, and through the process of writing this thesis. This accomplishment would not have been possible without them. Thank you.

TABLE OF CONTENTS

	Page
LIST OF ABBREVIATIONS.....	vii
CHAPTER	
1. BACKGROUND/CONTEXT.....	1
History of Emergency Medical Services.....	1
Combat emergency medicine.....	1
Development of EMS system in the United States.....	5
Anglo-American Emergency Medical System in the 21 st Century.....	11
Collegiate Emergency Medical Services.....	15
Arizona State University Emergency Medical Services.....	19
2. MOTIVATION	25
3. METHODS.....	26
Literature review.....	26
Survey and interview.....	26
4. RESULTS.....	29
5. DISCUSSION.....	36
6. CONCLUSION.....	38
Future directions.....	40
REFERENCES.....	41

ABBREVIATIONS

AEMT	Advanced Emergency Medical Technician
ALS	Advanced Life Support
ASU	Arizona State University
BLS	Basic Life Support
CAHEA	Council of Allied Health Education and Accreditation
CAAHEP	Commission on Accreditation of Allied Health Education Programs
CoAEMSP	Commission on Accreditation of Educational Programs for the Emergency Medical Services Professions
CBEMS	Collegiate-based Emergency Medical Services
EH&S	Environment Health & Safety
EMR	Emergency Medical Responder
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EMT-A	Emergency Medical Technician-Ambulance
EMT-B	Emergency Medical Technician-Basic
EMT-I	Emergency Medical Technician-Intermediate
EMT-P	Emergency Medical Technician-Paramedic
ILS	Intermediate Life Support
JEMS	Journal of Emergency Medical Services
MASH	Mobile Army Surgical Hospital
NCEMSF	National Collegiate Emergency Medical Services Foundation
NHTSA	The National Highway Traffic Safety Administration

1. Background/Context

1.1 History of Emergency Medical Services

Emergency Medical Services (EMS) provides effective and expedient care to those in need, to prevent mortality and morbidity. EMS is responsible for providing prehospital or out-of-hospital medical care to patients with medical emergencies. It is a complicated yet coordinated system consisting of private and public agencies and organizations, communication and transportation networks, hospitals and specialty care centers, medical and administrative personnel.¹ EMS functions at the intersection of health care, public safety, and public health.¹

1.1.1. Combat emergency medicine

The idea and practice of emergency medicine emerged from periods of war.² Starting with the Byzantine empire (330 A.D.-1453), Byzantine armies were equipped with medical corps, and stretcher-bearers were paid for each wounded soldier carried from the battlefield.² The practice of rescuing soldiers began with *The Tactics of Emperor Leo*, a Byzantine treatise on military science. This treatise encouraged the military to “give all the care you can to your wounded, for if you neglect them you will make your soldiers timorous and cowardly before a battle”.² Near the end of the 15th century, the Spanish armies had physicians and surgeons; and during the reign of Queen Isabella, in 1487, the Spanish military also established wagon ambulance services and basic field hospitals.

¹ *What Is EMS?*, n.d., <https://dchealth.dc.gov/service/what-ems>.

² “Medical Emergencies,” *MD Medical Newsmagazine* 22, no. 11 (1978): 101–13.

In Italy, *ospedali volanti* – “flying hospitals” – were established in 1701 in the Villa Reale in Turin.³ Those flying hospitals mainly provided sanitary services for the Italian army. The medical corps typically had the same order of rank and regulations as the army, with a primary duty to minimize loss due to deaths and diseases.³ During the Seven Years War in the mid 1700s, Marshal deBelle-Isle ordered the implementation of ambulant hospital systems.⁴ Despite having available ambulances during these wartimes, no system was in place to care for the wounded. The wounded usually remained where they were injured until the fighting was over.⁵ If defeated, the wounded soldiers were abandoned.⁵

The modern EMS system took shape during the late 1790s and early 1800s, during Napoleon’s time, when EMS was employed on war battlefields to help wounded soldiers.⁴ In 1792, Napoleon’s chief physician, Jean Dominique Larrey, initiated the use of EMS, developing a system to treat and transport wounded French soldiers.¹ He developed two-wheeled-horse-drawn ambulances, *ambulances volantes* (“flying ambulances”).⁵ The flying ambulances were utilized in the fields during active battles, instead of the previous practices of waiting for battles or combats to end. Larrey deemed it necessary to send surgeons to the wounded, instead of the other way around. First-aid in the battlefields became a matter of routine. The medical personnel collected wounded soldiers and evacuated them to “dressing stations” via heavy horse-drawn wagons.⁵ The more serious injuries were attended to where the soldiers fell, and emergency surgeries were done under fire. Larrey arranged systematized service of ambulances and movable hospitals, or first-aid stations known as “dressing stations” as a part of the army.⁵ He also executed “categorical rule for the triage of war

³ Arturo Castiglioni and E. B. Krumbhaar, *A History of Medicine*, 2019, <http://search.ebscohost.com/login.aspx>.

⁴ Manish N. Shah, “The Formation of the Emergency Medical Services System,” *American Journal of Public Health* 96, no. 3 (March 2006): 414–23, <https://doi.org/10.2105/AJPH.2004.048793>.

⁵ “United States Naval Medical Bulletin,” *The Bureau of Medicine and Surgery Navy Department*, 1919.

causalities,”⁶ which meant that the wounded were treated based on the seriousness and urgency of their injuries, regardless of their rank or nationality.

During the American Civil War (1861-1865), the Union Army initiated a system that evacuated injured soldiers from the field. Dr. Jonathan Letterman initiated mobile field hospitals for treating the injured soldiers on scene during battles.² At beginning of the civil war, the numbers of available doctors and combat medics were very limited. No field hospitals or aid stations were available for wounded soldiers. Too often, wounded soldiers would be on the ground where they fell or were hurt, and hours or days would pass before they received any treatments.⁷ Ambulances, which were four-wheeled wagons or two-wheeled carts, came into the picture two years after the beginning of the Civil War. On March 11, 1864, under the approval of President Lincoln, Congress passed the Uniform System of Ambulances Act, which standardized the ambulance system for all military forces.² The bill mandated one driver and two stretcher-bearers to each ambulance.⁷ Letterman’s ambulance system was made up of divisions, each division consisted of forty-two horse ambulances, multiple supply wagons, and a back-up wagon for repairs.⁸ The ambulances had seats that could be adjusted to allow three lightly-wounded men to lie horizontally. Overall the Union Army medical force included thirteen officers, 350 men, more than 300 horses, almost 100 ambulances, and a dozen supply wagons.⁸ On the other hand, the Confederate Army struggled to organize their own ambulance services during the American Civil War due to a lack of funds and materials. Dr. Samuel Moore, Surgeon General of the Confederate

⁶ Panagiotis N. Skandalakis et al., “‘To Afford the Wounded Speedy Assistance’: Dominique Jean Larrey and Napoleon,” *World Journal of Surgery* 30, no. 8 (2006): 1392–1399.

⁷ R.L. Kelley, “The Roots of EMS (Getting Back to Your Roots),” *Emergency Medical Services* 30, no. 2 (2001).

⁸ Scott McGaugh, *Surgeon in Blue: Jonathan Letterman, the Civil War Doctor Who Pioneered Battlefield Care*, 2015.

Army, attempted to create medical units with resources available to them.⁹ As the funds for the Confederate Army dwindled, the medical corps had to replace lost or broken ambulances with ordinary mule wagons, roofed with draped cotton cloths.⁹

Palliser Ambulance was the first gasoline powered ambulance, introduced in 1905 by Major Palliser of the Canadian Army.¹⁰ This military-designated ambulance was mass-produced in 1909 by the James Cunningham Son & Company in Rochester, NY, a company that was known for building hearses and carriages.¹⁰ World War I was the first war where horse-drawn ambulances were replaced by motorized ambulances. The U.S. used GMC model 16 trucks as field ambulances during World War I. Physicians often rode in hospital-based ambulances during the wartime. The use of air ambulances was also employed during World War I (WWI) and World War II (WWII), and airborne evacuation was significantly advanced during WWII. It was estimated that around 700,000 wounded soldiers were evacuated via aircraft during WWII, and 97 survived out of every 100 wounded due to quick access to treatments.²

‘Flying surgery’ was implemented during the Vietnam War; helicopters were converted to enable four simultaneous surgical operations on the spot.² During the Vietnam War, every soldier was within 25 minutes of a medical installation.² The first operating frozen blood bank was part of the naval hospital at Da Nang, Vietnam, located in a combat zone.¹¹ Mobile Army Surgical Hospital (MASH) was established during the Korean War.¹² These mobile hospitals provided immediate emergency surgical care to the wounded.¹² With the development of modern technology and helicopters, it became practical to utilize

⁹ Ryan Corbett Bell, *The Ambulance: A History*, 2013.

¹⁰ “ASTNA patient transport: principles and practice,” *Air & Surface Transport Nurses Association* (U.S.). (2017).

¹¹ Montgomery BJ, “A Capsule History of US Emergency Medical Care,” *JAMA* 243, no. 10 (1980).

¹² Otto F. M.D. Apel and Pat Apel, *MASH An Army Surgeon in Korea*, 2001.

helicopters as rescue transportations. MASH networks played an important role in the idea of triage in EMS nowadays. Through wartime medical efforts, medical corps recognized that injured patients had the highest chances of survival when patients are immediately stabilized on scene and receive effective care while being transported rapidly to definitive care.¹³

1.1.2. Development of EMS systems in the United States

The Humane Society of Philadelphia, established in 1780, was the original first-aid organization in the US.² This organization aided “the recovery of drowned persons, and of those whose animation may be suspended from other causes” such as hanging, overheating, poisoning, and overdosing.² Essentially, the Humane Society of Philadelphia served all the purposes of a first-aid-emergency organization. In 1881, Clarissa Harlowe Barton founded the American Red Cross.¹⁴ Prior to establishing the American Red Cross, Clarissa earned the nickname the “Angel of the Battlefield” during the American Civil War.¹⁴ She provided service to the Union soldiers in the battlefields, she nursed, comforted, and cooked for the wounded. The American Red Cross now aims to dedicate services to the American armed forces, and to provide disaster relief in the US.¹⁴

In 1865, the Cincinnati Commercial Hospital initiated the first civilian ambulance service in the United States.² New York City’s Bellevue Hospital provided civilian ambulance service as early as 1869.¹³ The first horseless (motorized) ambulance was created by Michael Reese Hospital in Chicago in 1899. It was capable of speeds up to 16 miles per hour.¹³ In 1936, American Red Cross established almost 900 posts, known as the Emergency First Aid

¹³ Yolles TK, “Emergency Medical Service Systems: A Concept Whose Time Has Come’. *Journal of Emergency Nursing: JEN*,” *Official Publication of the Emergency Department Nurses Association* 1, no. 4 (1975).

¹⁴ “Our History More Than a Century of Compassionate Service,” *American Red Cross History*. Accessed, March 30, 2019, <https://www.redcross.org/about-us/who-we-are/history.html>.

Stations, along highways in the United States to aid those involved in car accidents. Those stations were usually added to existing stores, gas stations, or fire houses.¹⁴ By 1939, there were almost 5,000 American Red Cross posts and mobile units along the highways. After WWII, hospitals started handing over their ambulance service jurisdictions to police departments, fire departments, and volunteer groups. Ambulances slowly became a transportation service.¹³

During the American Civil War, it was a goal to transport patients to a medical care facility within 48 hours.⁵ Today, modern EMS aims to transport patients to a hospital emergency department within the “golden hour,” sixty minutes after the onset of injury. Civilian EMS systems slowly formed after the American Civil War, and quickly expanded starting the 1960s.⁴ Other than the Uniform System of Ambulances Act that was passed in 1864 during the Civil War, there were no other added regulations in the world of EMS.

In 1960, only six states had standardized medical rescuer trainings.⁴ In the same year, President Kennedy declared that “traffic accidents constitute one of the greatest, perhaps the greatest, of the nation’s public health problems.”⁴ Traffic accidents were a major public health issue because there were rapid increases in health and financial costs resulting from traumas caused by motor vehicle accidents.

In September 1966, the Committee on Trauma and Committee on Shock of the Division of Medical Sciences from National Academy of Sciences/National Research Council presented the white paper “Accidental Death and Disability: The Neglected Disease of Modern Society” to President Lyndon B. Johnson.¹ It acknowledged accidental injuries as the main “cause of death among persons between the ages of 1 and 37”.¹⁵ “In 1965, 52

¹⁵ “Accidental Death and Disability: The Neglected Disease of Modern Society,” *National Academy of Sciences Staff*, 2000, <http://www.nap.edu/openbook.php>.

million accidental injuries killed 107,000, temporarily disabled over 10 million and permanently impaired 400,000 American citizens at a cost of approximately \$18 billion”.¹⁵ Out of the 107,000 injured deaths, 49,000 deaths were caused by motor-vehicle accidents. More American lives were lost due to car accidents than in the Korean War. The Committee also pointed out the lack of efficient prehospital emergency care, indicating there are higher chances of survival for those seriously wounded in the combat zone than on the city street.¹⁶ There were also no standardized regulations for prehospital providers, or “ambulance attendants”, and no standardized ambulance operations.^{15,16} A survey study in 1965 reported that out of the 900 participating US cities, less than 23% had regulations for ambulance services, and most did not require ambulance drivers to have training.¹⁷ Many identify the white paper as the catalyst for a change, and it led to the beginnings of modern EMS.¹⁸

The white paper’s recommendations were later incorporated into the Highway Safety Act of 1966. This Act was initiated because more than 50,000 people died in traffic accidents in 1965.¹⁹ The Act created several programs to reduce deaths and disabilities caused by highway crashes, and it established the EMS responsibilities of the US Department of Transportation. In the same year, 1966, Cook County Hospital in Chicago opened the first civilian trauma unit. This trauma unit began in the small dining room of the hospital, and is still operating today. In 1968, the Seattle Fire Department created and implemented the first

¹⁶ Edgerly D, “Birth of EMS. The History of the Paramedic’. JEMS : A,” *Journal of Emergency Medical Services* 38, no. 10 (2013): 46–8.

¹⁷ Mustalish AC, “Emergency Medical Services: Twenty Years of Growth and Development,” *New York State Journal of Medicine* 86, no. 8 (1986): 414–20.

¹⁸ “Iconic Moments in EMS: Recognizing the Moments, People, Technologies and Ideas That Shaped Modern EMS,” *Journal of Emergency Medical Services* 42, no. 3 (2017).

¹⁹ 11. Page J, “A Brief History of EMS.’ JEMS : A Journal of Emergency Medical,” *Services* 14, no. 8 (1989).

mobile care unit “Medic 1.” Both units were created despite the lack of national curriculum and standards for first responders.

In 1972, President Nixon identified EMS as a priority task in the nation’s health care effort in his State of the Union message, and he aimed “*to develop new ways of organizing emergency medical services and providing care to accident victims.*”²⁰ Nixon estimated that emergency medical services could save 100,000 heart attack deaths and 50,000 accident deaths.²⁰ EMS was a component for both President Richard Nixon’s “National Health Strategy of 1971” and Nixon’s “Comprehensive Health Insurance Plan of 1974,” collectively known as “Health Strategy for the 70’s”. These plans helped EMS receive additional administrative backing on the federal level.²⁰ In turn, this led to the signing of the Emergency Medical Services System Act of 1973 (Public Law 93-154 93rd Congress, S. 2410). A comprehensive EMS system was later developed, after the Department of Health, Education, and Welfare became the leading EMS agency secondary to the signing of Emergency Medical Services System Act of 1973. This act not only established the nationwide EMS systems, but also provided funding for communication networks, ambulances, equipment, training of prehospital providers, research in emergency medicine and procedures, and public education.⁴ It also authorized \$185 million in expenditures for the development of EMS in the United States. Also in 1973, the White House urged the nation to designate 911 as the number for emergency response services.¹¹ EMS was granted exclusive radio frequencies by the Federal Communication Commission in the next year. In 1976, the EMS System Act was renewed, and total of \$269 million was authorized for further EMS program development, trainings, and research.

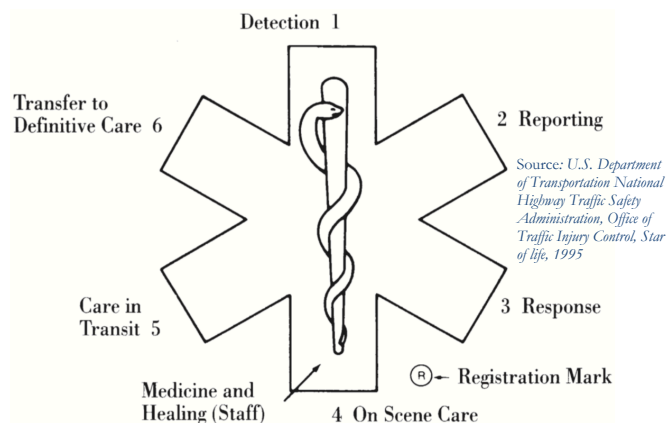
²⁰ Robert E. Streicher, “Emergency Medical Services,” *Health Services Reports* 89, no. 2 (1974), <http://www.jstor.org.proxyiu.uits.iu.edu/stable/4594996>Copy.

The White Paper in 1966 also declared a call for action for standardized trainings for emergent situations, and provided proper trainings for rescue squad staffs, policemen, firemen, ambulance staffs, and other first responders. This call for action led to the establishment of the first nationally recognized and uniform EMS curriculum in 1969 – emergency medical technician-ambulance (EMT-A). In 1970, the first board of directors of National Registry of EMTs (NREMT) had their first meeting, and they discussed the project of creating a national certifying exam.¹⁶ In 1971, Rocco V. Morando served as the founding executive director of NREMT, and 1,520 people took the first NREMT-Ambulance exam.¹⁶ The creation of paramedics came next. Despite the established national curriculum, many in the field believed more medical skills could be performed in the out-of-hospital setting, such as advanced airway procedures and management, vascular access, and medication administration. This eventually led to the development of emergency medical technician-paramedic (EMT-P) curriculum in the early 1970s, led by Dr. Walt Stoy, in Pittsburg.¹⁶ In 1971, there were only 12 paramedic units in United States.¹⁹ The first NREMT-Paramedic national exam was given in Minneapolis in 1978.

Around 1972, the expectation of advanced prehospital care grew rapidly in America, fueled by the iconic TV show *'Emergency!'*.¹⁶ On this TV show, on-screen paramedics performed advanced prehospital care to the public, both on the streets and in the homes of those sick and injured. James O. Page, who served as a technical editor for the show, was known as the father of modern EMS in the United States. As a writer, attorney, and the founding publisher of *Journal of Emergency Medical Services* (JEMS), he popularized the idea of EMS as a writer and advisor for the TV show *'Emergency!'*.¹⁸ By 1974, after Congress increased funding to improve EMS, more than 300 regional projects around the nation

existed to train EMTs, purchase better equipment, and define hospital capabilities in order to designate appropriate transportation of patients to the appropriate facilities.

EMS continued to grow rapidly and was quickly professionalized. The National Highway Traffic Safety Administration (NHTSA) of the Department of Transportation recognized the need for a symbol that the public could recognize and associate with EMS. Prior to the 1970s, EMS was represented by an orange or red cross, which was put to a stop after the American Red Cross requested NHTSA to change the symbol.¹⁸ Leo Schwartz, the leader of NHTSA's EMS branch at the time, developed the EMS Star of Life in 1977. The Star of Life is a star with six blue branches, with the Rod of Asclepius sitting in the middle, linking EMS to the house of medicine. The six branches, or the six "barred cross", was adopted from the personal Medical Identification Symbol of the American Medical Association. Each of the six branches represent a different aspect of EMS – detection, reporting, response, on scene care, care in transit, and transfer to definitive care.¹⁸



In 1978, the National Commission for Health Certifying agencies accepted NREMT as a member.¹¹ Council of Allied Health Education and Accreditation (CAHEA) approved EMT-P as an official health occupation.¹¹ Starting with the 1980s, many institutions started developing NREMT programs to be reviewed and approved by Commission on Accreditation of Allied Health Education Programs (CAAHEP) and Commission on Accreditation of Educational Programs for the Emergency Medical Services Professions

(CoAEMSP). Currently, both entities are still evaluating, reevaluating, and accrediting EMT and paramedic programs in the nation. By 1981, there were around 450,000 trained EMTs in the nation, with 35,000 of them being paramedics.¹⁹

Overall, EMS systems in the United States grew rapidly from 1960 to 1973 due to medical, historical, and social forces.⁴ Originally known as the “First Aid on the Highways,” EMS has slowly transitioned from being viewed purely as a transportation service to also providing medical services. Since its invention, EMS has expanded significantly and has come to play a major role in comprehensive health care systems. The EMS system today aims to provide high-quality acute care to all individuals experiencing medical emergencies, assist community public health through injury control and disease prevention programs, contribute to disease surveillance, and address new community needs.⁴

1.2. Anglo-American EMS System in the 21st Century

Today, there are many models of emergency medical services in the world. Two major EMS models in the prehospital settings are the Anglo-American and the Franco-German model. For the purpose of this thesis, only the Anglo-American model will be discussed. The Anglo-American EMS system is more likely to be practiced in countries with emergency medicine as a developed medicinal specialty. The system is implemented in most English-speaking countries like the United States. The main medicinal providers for Anglo-American EMS system are paramedics and EMTs, and EMS functions as part of public safety organization. Today, EMS is defined as the acute care service that is provided prehospital, with transportation option to definite care.⁴ Definitive care is defined as the medical therapy and intervention that the patient requires for complete recovery from the

medical condition, which is provided by an appropriate level of medical facility. EMS services are provided to patients with acute illnesses and injuries.

The most common EMS type is an ambulance organization. Ambulances function to transport patients from scene of injury or sickness to an appropriate medical facility. Ambulances can also be utilized for transporting patients from one medical facility to another, such as from a free-standing emergency department to another facility's intensive unit. This is known as inner-facility transport. In the United States, fire departments play a large role in EMS due to the presence and involvement of fire departments in local communities. Typically, firefighters are also trained as emergency medical technicians and can respond to medical emergencies. Although the EMS system is under federal regulations, there are many different types of EMS organizations:²¹

- (1) Government EMS which is operated separately from the police and fire services,
- (2) EMS service that is linked to and operated by fire or police departments,
- (3) Voluntary EMS operated by charities and non-profit organizations,
- (4) Private ambulance service which can be used for special events and transportation for both emergent and non-emergent medical patients,
- (5) Combined emergency services which are operated at airports or large colleges and universities, and
- (6) Hospital-based.¹

The combined emergency services are full-service, self-sufficient EMS agencies, and the multi-functionality of combined EMS permits specific communities to maximize their limited resources, personnel, and budget.¹

²¹ "Information For The Public - Emergency Medical Technicians" *National Registry*, n.d., <https://www.nremt.org/rwd/public/document/public-ems>.

Secondary to the quick advances in EMS systems with progress and improvements since the 1960s, new systems and new personnel roles were developed. New medicinal personnel include emergency medical technicians and paramedics. While EMS agencies can be grouped based on their type of organization, EMS personnel can be grouped based on their certifications and trainings. There are different levels of certifications for the providers in EMS:²¹

- (1) Emergency Medical Responder (EMR), or First Responder,
- (2) Emergency Medical Technician (EMT), or Ambulance Technician or EMT-Basic (EMT-B),
- (3) Emergency Medical Technician – Intermediate (EMT-I),
- (4) Advanced Emergency Medical Technician (AEMT), and
- (5) Paramedic (EMT-P).

There are two major classes of EMS providers – EMTs and paramedics. EMT is the general term given to EMS providers, however, it branches into EMT-B, EMT-I, and AEMT. EMT-I and AEMT are considered as mid-level EMS providers, and their scope of practice varies based on local and state regulations. Providers must obtain EMT-B certification prior to becoming a paramedic. Paramedics receive the most rigorous training of all EMS providers.

The different levels of certification are given to individuals once they receive and pass necessary medical education and clinical trainings. The classifications of the prehospital medical professional determine the extent of treatments they are allowed to provide and the medical devices and supplies they are allowed to use. EMRs, or first responders, receive minimal first-aid trainings. First responders, with the most basic level of prehospital emergency medicine training, are able to treat immediate life-threatening emergencies such

as cardiac arrest and hemorrhagic bleeding. They are able to provide rescue breathing, CPR, defibrillation using AEDs, control bleeding using dressings and bandages or tourniquets, administer oxygen, and stabilize fractures. Ambulance Technicians or EMT-Bs receive more education on patient assessments, application of cervical spine immobilization devices, victim extrication, emergent obstetrical patients and delivery of babies, and basic triage of mass casualty incidents. EMT-I and AEMT have more training than EMT-Bs, but less than paramedics. Beyond similar abilities with EMT-Bs, EMT-Is and AEMTs can administer additional medications, such as epinephrine for patients in anaphylactic shock and sodium chloride fluid for through intravenous lines (IVs).¹ Paramedic, or EMT-P, is the highest level of prehospital certification. Paramedics receive extensive education in anatomy and physiology and other advanced medical treatment techniques. In some states, paramedics can administer more than 60 medications via various routes such as subcutaneously, intramuscularly, intravenously, endotracheally and intraosseously. They can also perform other skills such as giving nebulizer treatments, external cardiac pacing, chest decompression, and cricothyrotomy.¹

A way to distinguish prehospital providers is through the different levels of medical trainings the providers receive prior to practicing. The different levels are Basic Life Support (BLS) and Advanced Life Support (ALS). BLS providers are EMT-Bs, who are able to practice basic life-saving techniques focusing on airway, breathing, and circulation – “ABCs”. For airway, BLS providers are able to insert airway adjuncts such as oropharyngeal airway devices or nasopharyngeal airway devices. BLS providers are able to administer oxygen to patients in need of breathing aid, and perform cardiopulmonary resuscitation or apply tourniquets to address the ‘C’ in “ABCs.” ALS providers are paramedics, and are able

to perform more invasive procedures such as intubation, cardiac monitoring and defibrillating, transcutaneous pacing for heart rate control, and administering medication through intravenous cannulations or interosseous accesses.¹ To obtain a certification in EMS, individuals must complete trainings for Emergency Medical Technicians through community colleges or other educational institutions, and pass a computer-based National Registry exam. After obtaining the national certification, an individual may begin practicing as a prehospital provider once he or she is registered with local or state EMS authority.¹

1.3. Collegiate Emergency Medical Services

EMS is integrated into all aspects of the civilian world, including college and university campuses. Emergency medical care is a vital element of college health services. Emergency room visit rates for the US population is about 300 visits per 1,000 people per year.²² It was estimated that the cost of a student's visit to an emergency room is almost three times as much as a visit to the on-campus emergency care clinic.²² Colleges also frequently hire their own police forces to handle law enforcement on the campuses.²³ The same goes for EMS. Collegiate-based Emergency Medical Services (CBEMS) is a special model for prehospital care. CBEMS is an umbrella term for established EMS organizations that exist and serve on college or university campuses. No definitive history of CBEMS has

²² Jack McKillip et al., "College Students' Use of Emergency Medical Services," *Journal of American College Health* 38, no. 6 (May 1, 1990): 289–92, <https://doi.org/10.1080/07448481.1990.9936202>.

²³ DC Cone King BR BS Zachariah and P Clark, "A survey of emergency medical services systems on college and university campuses," *Prehospital and Disaster Medicine* 11, no. 4 (1996).

been established, however, the earliest CBEMS organization at Pennsylvania State University traces back to 1948.²⁴

Compared to normal community populations, average college students are relatively healthier, thus they have lower demand for EMS services. Although student populations may not necessarily overwhelm the community EMS service, it is still beneficial to have campus-based EMS.²³ In college and university settings, large populations of students, staff, faculty, and visitors gather in small, confined geographical regions; the layout of college or university campuses are often complex and not easily accessible. Many colleges and universities can be set up in a secluded section of a rural or urban area, and may be hard to reach by community-based EMS groups. In order to take care of patients suffering from acute illness or injury on a college or university campus quickly, many developed their own campus-based EMS groups.

Campus-based EMS systems can play important roles – 1) those organizations can serve as first responders for the community-based systems and decrease time between the call for help and the arrival of higher-certified EMS personnel, 2) provide essential backup for the community-based EMS systems, especially when EMS is in high demand by the surrounding community, and 3) CBEMS plays an educational role for the participating students.²³

Different collegiate EMS may vary in their levels of care and transportation capabilities. Different levels of care include – first responder, basic life support (BLS), intermediate life support (ILS), advanced life support (ALS), and combinations of BLS and

²⁴ Jonathan Fisher et al., “Collegiate-Based Emergency Medical Services (EMS): A Survey of EMS Systems on College Campuses,” *Prehospital and Disaster Medicine* 21, no. 02 (April 2006): 91–96, <https://doi.org/10.1017/S1049023X00003411>.

ALS.¹ The kinds of responses that collegiate EMS teams may provide can differ due to variations in response vehicles. CBEMS response vehicles include bikes, golf carts, SUVs, and ambulance.²¹ EMS or other public service agencies operate in a wide range of body size, staffing levels, and skills, and the same applies to CBEMS. Leadership styles may also differ for CBEMS; CBEMS can be organized and led by either a college or university's administrative office, or by students attending the school. Collegiate EMS organizations may have customized standard operational protocols due to the size of population served, coverage area, coverage hours, organizational oversight, budget source, number of members, and staff compensation. Some CBEMS operate with a small group of members who respond to medical emergencies on campus by foot, provide BLS care, and transfer care to local governmental aid such as a fire department or ambulance team once they arrive on the scene. Other CBEMS groups may function with a larger established member body, provide ALS care, and have the capability to transport patients to campus health services centers or local hospitals.

One of the unique features of CBEMS is its proximity to local medical emergencies and the quick response times – usually averaging less than 3 minutes. CBEMS participants also benefit from being familiar with the layout of their own college or university campuses. Not only can collegiate EMS provide quick and efficient care to sick and injured individuals on college or university campuses, CBEMS can also provide members with leadership training and mentoring experiences that may not be available for a typical college student. Students who participate in CBEMS are able to engage meaningfully in their campus community.

The National Collegiate Emergency Medical Services Foundation (NCEMSF) was established and had its first official gathering in 1993; it exists to advocate, encourage, and provide support for collegiate EMS organizations.²⁵ As of September 2018, there were 252 registered collegiate EMS organizations in the United States. NCEMSF is a 501©(3) non-profit organization dedicated to creating a safer and healthier college and university campus environments by promoting and supporting campus-based EMS. The foundation pushes for the advancement of existing campus-based response groups and for the development of new response groups. Prior to the formation of NCEMSF, CBEMS groups functioned in isolation without much communication with other related organizations.²⁴ In 1996, a survey conducted by King *et al* indicated that 234 out of 919 (25.5%) of the surveyed and participating colleges or universities had an established EMS system on campus.²³ A cross-sectional study was conducted in 2005 for the ‘current state’ of CBEMS organizations, based on information provided by NCEMSF via its web-based data collection system.²³ Available on its website, NCEMSF has a web-based registry of member organizations. Each of the member organizations, or CBEMS, has an admin liaison to keep information on the NCEMSF updated – that information includes demographics of CBEMS, level of service, type of response, and school website.²³

There have been a few original research studies done on an individualized organization level examining the development and history of different collegiate EMS agencies. However, there has not been a focused nation-wide study on the evaluation of up-to-date status of collegiate EMS since the 2005 study.

²⁵ National Collegiate Emergency Medical Services Foundation, n.d., <https://www.ncemsf.org/>.

1.4. Arizona State University Emergency Medical Services

Each collegiate EMS situation is unique, shaped in part by its local details. At Arizona State University (ASU) in 2008, Student Emergency Medical Services (SEMS) was founded as an all-student-run volunteer organization. Funds for SEMS came from ASU undergraduate student government. At that time, the university had a total of 67,082 enrolled students and four campuses.²⁶ In 2016, the leaders at SEMS officially proposed to ASU to take on SEMS as a department within the university. In 2018, SEMS officially changed its title to ASU EMS, after becoming an official department at ASU under Environment Health & Safety (EH&S) Department Fire Marshal's Office. In 2018, ASU EMS transitioned from a student club to an official department at ASU with one staff position and over twenty student worker positions, and ASU now has total of 72,709 enrolled students spread among five campuses.^{25,27}

When SEMS was first established in 2008 by Sean McMullen and advisor Dr. Stephanie Schroeder, ASU Health Services offered the founders the potential to become a department under Health Services. However, if SEMS were taken under ASU Health Services, the EMTs and Paramedics would have had a severely limited scope of practice due to liability concerns. This limited scope of practice includes no medications, such as oxygen or oral glucose, and the EMTs and Paramedics would have had very little freedom to make medical decisions. Instead of limiting the potential of the organization, the founders took the organization in a different direction, as a volunteer group. As volunteers, SEMS members were able to utilize their full scope of practice. Throughout the years, there were numerous attempts to transition to a department. There were talks of joining under the ASU Police

²⁶ *Enrollment Trends - Metropolitan Campuses*, n.d.

²⁷ *University History and Milestones*, n.d., <https://www.asu.edu/about/university-history-and-milestones>.

Department, ASU Health Services, and EH&S. The talks with EH&S lasted about 3 years from the initial proposal until an offer was finally made. During the transition process, the organization collected detail information on its financial operations – how much the organization was making, how many hours the volunteers were working. Statistical models were used to predict how many volunteer hours and revenue return were expected for the following fiscal years.

The earliest document meetings between ASU EH&S and previous SEMS leaders happened in September 2015. The main purpose of the meeting was for SEMS to demonstrate the need and significance for the organization. The leader at the time, Sean McMullen, pointed out the significant growth in terms of requests for service since its inception. Unfortunately, there was not a consistent database for special event standby requests since SEMS' establishment in 2008; many special events prior to the year 2015 were handled through email, phone calls, or face-to-face interactions, and were not logged. Below is a table that detailed the number of events covered, number of shifts worked, and the total volunteer hours volunteered by ASU students at SEMS from 2011 to 2015.

Academic year	Events covered	Shifts worked	Volunteer hours
2011-2012	199	319	1,403
2012-2013	190	394	1,774
2013-2014	206	673	3,048
2014-2015	212	821	3,665
Totals	807	2,207	9,890

From 2008 to 2013, only 10 event requests were denied by SEMS. The reason for declining events was usually attributed to shortage in manpower; there were not enough EMTs who were available for the shifts secondary to members' school and work schedules.

When SEMS was formed initially, funding was provided entirely by the ASU Residence Hall Association (RHA). Within one year of its inception, SEMS began receiving some money from the ASU Undergraduate Student Government (USG) Appropriation process. In Fall 2010, SEMS received \$11,500 through a USG Senate Bill. RHA slowly started decreasing financial support for SEMS since Fall 2010, and cut off all support in 2012. USG funding for SEMS never exceeded over \$10,000 per year, and has typically remained between \$5,000 to \$8,500. SEMS also received donations from Panhellenic and ASU Sun Devil Athletics. Funds were used by SEMS to buy supplies and equipment, which are stored in an office in McClintock Hall. The offices for SEMS are provided free of charge by ASU Residential Life, and it still remains this way for current ASU EMS. SEMS originally provided EMS coverage for special events on ASU campuses free of charge. However, to make the organization more financially self-sustaining, leadership for SEMS decided to charge an hourly rate of \$85/hr starting in Fall 2015 for special event coverages.

The main stakeholders for the original meetings in 2015 between EH&S and SEMS were 1) Jackie Murrill – Business Operations Manager Sr.; EH&S, 2) Jim Gibbs – Fire Marshal; EH&S, 3) Laura Ploughe – Director of Business Applications & Fiscal Control; University Business Services, and 4) Sean McMullen – founder of SEMS. In the original meetings, Jackie Murrill spoke about the possibility of taking SEMS in as a department under EH&S as early as January 2016. The original vision was to make SEMS as a Service Center, still with volunteer EMTs and ECOs, however with a part-time paid administrator. That was

the original proposal for SEMS administrator, which has developed into the EMS Coordinator position today. The prior Fire Marshal, Jim Gibbs, proposed drafting a policy which limits ASU organizers to hire outside EMS/first aid groups. All parties at the meeting agreed that the future success of SEMS relied on a policy that limits the extent to which event organizers can use the outside agencies which are non-ambulance and non-fire department based. Jackie Murrill and Laura Ploughe were to meet with ASU Financial Services and pass along the proposal for SEMS to transition into an official department.

From the beginning of 2016 to early 2018, there was a two-year wait period with slow progress. On April 1st, 2018, SEMS officially made its transition to ASU EMS under EH&S at ASU, and received \$125,000 for funding for the fiscal year of 2018 to 2019. ASU EMS was funded by the office of the Chief Financial Officer, with the goal of having ASU EMS become a self-funded unit eventually. The \$125,000 budget was proposed to hire on a full time administrator, student worker staff, and purchase necessary equipment and supplies. Michael Overmyer, who previously volunteered with ASU EMS, now serves as the EMS coordinator, which is the full-time administrator position. The EMS coordinator is now a full-time paid staff position, and it oversees the personnel, finance, logistics, operations, and outreach for the program. Since its transition, there has been a 122% increase in the number of EMS coverage requests in one year. ASU EMS has covered 59 events over 257.50 hours since April 2018. The main source of income for ASU EMS is special events coverage on campus; ASU EMS charges an hourly rate to organizations or departments that host special events on the ASU campuses. In one year, this EMS program has generated \$25,572.50 in gross income by providing standby EMS coverage. This is a 128% increase in gross revenue from the previous fiscal year, prior to ASU EMS' transition.

There is a parallel relationship between the ASU police department and ASU EMS. Secondary to an embedded police department within a university, the school has direct influence and a direct line of communication with the police department. Therefore, the police department will act with the best interests of the school and students. ASU is comparable to a small city, thus learning about the intricacies of the campus and the students is vital to the success of emergency services on the campuses. ASU EMS is a service that is tailored to the need of the university and its populations. Other than providing crucial life safety services to the university, ASU EMS also has saved University departments about \$16,000 by not utilizing outside private companies to provide EMS standby coverage. ASU EMS also provides an education opportunity that cannot be experienced in classrooms. The organization gives students the opportunity to ‘learn by doing’ after the students receive proper classroom trainings and certification. The success of this organization matters because college and university campuses have a unique setting, and providing adequate and customized emergency medical services is important. This EMS program at ASU has been in operation since 2008 as an all-volunteer organization under the ASU Undergraduate Student Government. ASU EMS has been excelling in providing quality EMS to the university after being absorbed by EH&S department under the university’s Fire Marshal’s Office. ASU EMS aims to 1) provide EMS coverage to special events on all ASU campuses and facilities, 2) provide safety trainings, cardiopulmonary resuscitation trainings, and continue education trainings to the ASU community, 3) check the adequacy of automated defibrillator devices on campus, and 4) assist in the emergency response to medical emergency incidents on the ASU Tempe campus.

Within the first year of ASU EMS' transition, there has been a 122% increase in EMS standby requests, 128% increase in gross revenue, 28 student workers were employed, and approximately 800 people were trained in CPR on campus. ASU EMS originally started as a dream to unite young students who were interested in serving their community by providing prehospital emergency medicine to the sick and injured, and now it has turned into a group of professionals that are well respected by their colleagues and community alike. Transitioning from an all-volunteer group to paid professionals, ASU EMS providers and the organization has gained respect from other providers and administrators that operate within and around ASU.

2. Motivation

There are two purposes of this study: 1) to repeat previous national survey studies and identify the new changes to Collegiate EMS organizations as of 2019, and 2) to trace and understand the history of ASU EMS transitioning from a student-run-volunteer organization to an official department under the guidance of ASU EH&S Fire Marshall's Office.

3. Methods

3.1. Literature Review

A thorough literature review of databases with historical or medicinal literature profiles provided understanding of the nation-wide history of EMS development, and specifically for the development of collegiate EMS. The literature search for this thesis project was conducted in two stages. First, Google searches helped discover the gray literature, specifically using individual or combination of the terms: Emergency Medical Services, EMS, History of Emergency Medical Services, Development of EMS, Emergency Medical Technician, paramedic, and Collegiate EMS. The second part of the literature search was for peer reviewed literature and books. Using WorldCat OCLC, a list of bibliographies was compiled using the search phrase: History of EMS. Selection criteria for both searches were publications in English, and the literature focusing on History of EMS in the world, History of EMS in the United States, and history, development, and evaluations of current collegiate EMS organizations. Using the specific search terms in the general search for all databases with processes of elimination of unrelated items identified relevant journal articles and books. The inclusion criteria assessed whether the literature explains the history, development, and evaluation of EMS and collegiate EMS organizations. This review was to provide an understanding of the history and context for EMS development.

3.2. Survey and Interview

The study has two phases. For the first phase, which is the national survey study, the participants were representatives of the 252 collegiate EMS organizations in the United states

that have registered with National Collegiate Emergency Medical Services Foundation. These organizations received surveys via email, which requested a leader of the organization to fill out the survey. The NCEMSF has an electronic registration database of all member organizations, and the registry information is self-reported by individual collegiate EMS organizations.⁶ Utilizing the NCEMSF web-based database, the names and locations of US collegiate EMS organizations were obtained. Surveys were sent out to all collegiate EMS organizations in the United States via email through the SurveyMonkey Platform. Survey categories and information include demographics, population size, staffing, type of response, budget, medical direction, and organizational supervision. The results were collected and stored in Microsoft Excel and the SurveyMonkey platform to be used for analysis. Additional survey questions were used to further analyze the capabilities of CBEMS and pinpoint the specific features. These additional questions were open ended/multiple choice. It was expected that the survey took about 20 minutes to complete.

For the second phase, participants were selected as interview subjects. To understand the history and development of ASU EMS since its establishment in 2008, interviews were conducted with key stakeholders. Potential subjects include administrative staff who partook in the process of helping ASU SEMS to transition to ASU EMS – from the ASU EH&S department, ASU athletics department, and ASU Business & Finance department. These subjects were specifically selected in order to understand the history and the transition of Student EMS at ASU to ASU EMS. For the subject selection process, the current EMS coordinator of ASU EMS was consulted. The current EMS Coordinator, Michael Overmyer, provided a list of stakeholders who played essential roles in helping the transition process of ASU EMS. These key players were then recruited via email for in-person interviews. In

addition to in-person interviews, detailed tracking of documents saved in the shared leadership google-drive folder was also done. The Google-drive contained documents ranging from 2008 to the summer semester of 2018.

The protocol for survey and interview study of “*Investigating the Current Status of Collegiate Emergency Medical Services (EMS) Organizations via a National Survey Study and Tracing the History of Arizona State University Emergency Medical Services Department*” was submitted to and received exemption by Arizona State University IRB. This study, IRB ID STUDY00009395, is conserved exempt pursuant to Federal Regulations 45CFR46. The following materials and documents were submitted to IRB prior to this exemption:

- (1) Survey recruitment letter, Category: Recruitment Materials;
- (2) a copy of survey questions, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);
- (3) Interview recruitment letter, Category: Recruitment Materials;
- (4) ASU Social-Behavioral IRB Protocol, Category: IRB Protocol;
- (5) Interview consent form, Category: Consent Form;
- (6) Interview questions, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); and
- (7) Survey consent form, Category: Consent Form.

4. Results

EMS system models in the United States are numerous and they vary based on many factors, making a fully encompassing description of EMS models nearly impossible. Many college and university campuses also have their unique EMS organizations that function to provide rapid response to prehospital medical emergencies. A national survey was sent to the Collegiate Based EMS organizations that are registered with NCEMSF, and total of 24 responses were received on the SurveyMonkey platform. One CBEMS organization opted out of the survey after filling out the demographic descriptors, thus the sample size decreased to 23 starting with questions regarding the response capacity descriptors. The collegiate EMS organization survey is divided into five different categories – demographic descriptors, response capacity descriptors, coverage descriptors, organizational descriptors, and logistical descriptors. The following tables show the compiled data received from the 24 organizations.

Table 1. Demographic information for Collegiate EMS organizations.

Demographic Descriptors		Number (%) n=24
Geographic region	Northeast	16 (67%)
	Southeast	2 (8%)
	Central	1 (4%)
	Northwest	1 (4%)
	Southwest	2 (8%)
	West	2 (8%)
Type	Public institution	14 (58%)
	Private institution	9 (38%)

	Other	1 (4%)
Location	Rural	4 (17%)
	Suburban	11 (46%)
	Urban	9 (38%)
Student population of the institution	<1,000 students	1 (4%)
	1,000-9,999 students	12 (50%)
	>10,000 students	11 (46%)

As defined by the National Collegiate EMS foundation, there are six CBEMS geographical regions, with majority of CBEMS organizations located in the northeast region. CBEMS organizations exist on both public and private institutions, as well as governmental academies such as the Federal Service Academy.

Table 2. Response capacity information for Collegiate EMS organizations.

Response Capacity Descriptors		Number (%) n=23
Staffing level	First responder	1 (4%)
	Basic Life Support (BLS)	20 (87%)
	Intermediate Life Support	0 (0%)
	Advanced Life Support (ALS)	2 (9%)
	BLS/ALS combination	0 (0%)
Response level	Non-emergent/walk-in	1 (4%)
	Emergent/911	17 (74%)
	Special events	3 (13%)

	Emergent/911 and special events	2 (9%)
Transport capabilities	Non-transport	16 (70%)
	Transport	7 (30%)
Emergency response vehicles	No response vehicles – respond to calls by foot	3 (13%)
	Bikes	2 (9%)
	Golf carts	4 (17%)
	Cars	7 (30%)
	Ambulances	6 (26%)
	Fire ladders/engines	1 (4%)
Automated External Defibrillator (AED)	Yes	21 (91%)
	No	2 (9%)

A majority of CBEMS organization members are certified EMT Basics, and majority of the organizations respond to emergent 911 medical calls. Others participate in special event standby coverages such as for college athletic events. About 70% of the CBEMS survey participants are non-transport agencies, and about 87% have emergency response vehicles. An overwhelming majority of the organizations carry their own designated AEDs – about 91%.

Table 3. Coverage information for Collegiate EMS organizations.

Coverage Descriptors		Number (%) n=23
Coverage area	On-campus only	15 (65%)
	Off-campus only	0 (0%)

	Both	8 (35%)
Population served	1,000-9,999 students/staff/faculty/visitors	12 (52%)
	10,000-49,000 students/staff/faculty/visitors	6 (26%)
	50,000-89,000 students/staff/faculty/visitors	2 (9%)
	89,000+ students/staff/faculty/visitors	3 (13%)
Coverage hours	24/7; entire year	4 (17%)
	24/7; during school only	11 (48%)
	>12 hours/day; entire year	2 (9%)
	>12 hours/day; during school only	2 (9%)
	<12 hours/day; entire year	2 (9%)
	<12 hours/day; during school only	2 (9%)
	Special events coverage only	2 (9%)
	Other	2 (9%)

Table 4. Organizational information for Collegiate EMS organizations.

Organizational Descriptors		Number (%) n=23
Organizational oversight	Campus health center	3 (13%)

	Public safety department	8 (35%)
	Student government	1 (4%)
	Municipal agency	0 (0%)
	Other	11 (48%)
CBEMS organization type	University department	10 (43%)
	Student organization	9 (39%)
	Both	4 (17%)
Operate under the Good Samaritan Act	Yes	9 (41%)
	No	10 (45%)
	Unknown	3 (14%)
Malpractice insurance	Yes	12 (52%)
	No	8 (35%)
	Unknown	3 (13%)
Active members	1-10	1 (4%)
	11-25	7 (30%)
	26-50	6 (26%)
	50+	9 (39%)
Staff compensation	All volunteer	13 (57%)
	All paid	4 (17%)
	Volunteer/paid mix	6 (26%)
Members are university employees	Yes	10 (43%)
	No	13 (56%)

Most of the organizational oversight for CBEMS occurs within the university, such as by campus health center, public safety department, housing department, campus legal, student affairs, and student government. Other university departments that also serve as organizational oversight include emergency management, environmental health and safety, university fire marshal's office, university fire academy. Some CBEMS are overseen by an outside agency such as a contracted local health system and non-profit corporations. All CBEMS organization are compliant with state and regional regulations, protocols, and laws. Local protocols, operational protocols, or standing orders for the CBEMS organizations specifically are signed off by medical directors for the organization.

The organizations must have a medical director to oversee the organization. The medical director does not have to be associated with the university health services. The CBEMS organizations are recommended to be covered by insurance for cases that are not covered by the Good Samaritan Act. The Good Samaritan Act provides protection to individuals who voluntarily assist injured, sick, or ill persons. Different types of insurance apply to CBEMS organizations, such as self-insurance, general liability, management liability, auto insurance, workers' compensation, umbrella coverage under student health center, malpractice insurance, and general university coverage.

The budget source for CBEMS also differs. CBEMS organizations receive funding via contracting with university athletics department, state funding, school funding, federal budget, student government or student council, campus safety, student activity fees, department budgets, or student health fee. The organizations can also be self-funded, charging for EMT, CPR, or first aid classes, or be compensated by billing for service. Other than monetary compensation, the CBEMS organization members can receive compensation

via achievement recognition by the university, receiving service hours, free campus parking or free parking passes, free room and board at campus fire station, free CPR and other trainings, free uniform and free foods on shifts, or work-study compensation. Out of 23 organizations who completed the survey, 9 of those organizations offer EMT courses to the university students. 17 of those organizations offer continuing education hours to the organization members.

Table 5. Logistical information for Collegiate EMS organizations.

Logistical Descriptors		Number (%) n=23
Dispatch agency	Self-dispatched	5 (22%)
	Campus security/911	12 (52%)
	Municipal 911	4 (17%)
	Self-dispatched/911	2 (9%)
	Combination	
Average response time	0-2 min	4 (17%)
	3-4 min	16 (70%)
	5-9 min	3 (13%)
	>10 min	0 (0%)

Although all CBEMS organization serve to respond to the sick and injured on university campuses, there are varieties with the organizational structures and administrative oversight. These differences ultimately lead to different administrative regulations, member requirements, staffing levels and sizes, and medical capabilities.

5. Discussion

Due to fragmented system development prior to federal regulation in the late 1960s, there is no unified EMS system. The systems differ state by state due to geographical, jurisdictional, political, and fiscal disparities and differences. Similar to other first response or public safety organizations such as fire or police departments, emergency medical services organizations have a variety of differences in the size of the organizations, staffing levels, capabilities of personnel, administrative oversight, et cetera. This also applies to collegiate-based EMS organizations.

Some CBEMS organizations with shorter histories exist as small-membered groups with no emergency response vehicles, and they respond to medical emergencies on campus by foot. Usually, these small CBEMS organizations respond to the patient prior to municipal agencies arriving on scene and assuming care. Some CBEMS organizations are able to provide advance-life-support medical skills and transport patient to definitive care, such as to the campus health center or a nearby community hospital.²⁴ One of the most unique features of CBEMS is their proximity to calls and the members' familiarity with the campus layout. Based on the national survey, about 87% of the participant organizations respond to calls and arrive on scene within 4 minutes. About 57% of the organizations only cover hours during the school year. That number can be attributed to the organizations aiming to serve on-campus students, staff, faculty, and visitors; and there is a greater number of people on campus during the school year. About 87% of the CBEMS organizations are staffed by basic-life-support providers, or EMTs.

Some suspect that the level of training of CBEMS providers are lacking. It might be true that CBEMS' members lack years of experiences in the field, as many are college

students who are just receiving their NREMT certifications. However, they receive the same amount of training and testing as the individuals who work for municipal EMS agencies. Another essential role that CBEMS plays is early defibrillation with their short response times. About 91% of the CBEMS organizations have their own designed AEDs. AEDs are essential for providing early defibrillation to save individuals from cardiac arrests caused by ventricular fibrillation and ventricular tachycardia. Early defibrillation is key to survival and one of the first steps in the chain of survival for cardiac arrest patients. In many ways, the demand of a university community can be compared to a city. Depending on the size and population of the university, many universities assemble their own police, fire, safety, and EMS units. CBEMS organizations exist to respond to medical emergencies on college or university-campuses quickly, to treat and stabilize patients, and transport them to definitive care if deemed necessary.

Due to the lack of survey responses, it would be difficult to compare the survey results of this study to the prior survey studies in 1996 and 2005.

6. Conclusion

Models of EMS are categorized as non-emergent or transfer services and emergency care. Emergency care EMS systems are then categorized into governmentally-owned or privately-owned. Hybrid EMS models also exist, where a partnership forms between a private EMS company and the municipal agency. Collegiate-Based EMS organizations have a relatively short history; however, it is quickly evolving. There are multiple benefits from implementing a CBEMS organization on campus. Because CBEMS organizations are usually made up of members who also attend the university, the members who respond to medical calls are familiar with the campus layout and are able to reach the scene of the injury quickly. Since the EMTs who work for CBEMS organizations are typically relatively young college students, the sick and injured patients on campus often feel more comfortable and relatable with their providers, which ultimately creates a better patient-provider rapport.

Considering that CBEMS takes place in university settings, and that the primary goal for academic institutions is education, having CBEMS provides additional educational opportunities. These opportunities are not just for the members of the program, but also the whole university community. Many CBEMS organizations provide EMT courses and trainings, first-aid classes such as bleeding control and tourniquet usage, and CPR classes. Another important aspect of establishing CBEMS is to provide students an opportunity to work as first responders or EMTs while still being a full-time student. This way, students do not have to necessarily worry about having to commit to a full-time job off-campus.

Being involved with ASU EMS since 2014, and previously serving as the captain, Deputy Chief, and then EMS Coordinator, it has been phenomenal to witness the growth of the organization. From originally being a student organization to now a respected

department, the transition process was not easy. From the original leaders of the group working on proposing and attending meetings, to a three-year process, ASU EMS finally received the budget to be funded as a department in 2018. After being transitioned into a department, ASU EMS is more professional, organized, and exists as an official entity that earns the respect of other departments and organizations. ASU EMS now works alongside EH&S, ASU Health Services, and the Tempe Fire Department. There is now a steady increase in requests for services and EMS stand-by coverage. ASU EMS is providing professional customer service now more than ever. The organization has paved the way for a massive number of student workers, who carry a professional certification, to work for the ASU community that they take part in. ASU EMS has about 20 student workers at all times, though it does fluctuate depending on the students' schedules and school workload. Members do not have to get other part-time employment. They can work for the ASU community doing something they love, using their skills, certifications, and trainings. There has been a constant staffing level of 100% for ASU EMS 911 shifts and special events stand-by coverages. ASU EMS is now being recognized as part of the university to provide a professional service. Other advantages of ASU EMS include that the program now does generate a revenue, and it is in charge of inspecting and maintaining all AEDs on all ASU campuses. By working regular on-campus 911 shifts and special events, the organization is promoting EH&S and EMS program to the ASU community.

ASU EMS has transformed for the better. The organization has achieved more in the past year after its transition into an official department than it did for the last 10 years as a volunteer program. After the program expansion, the income has tripled, students are provided with employment opportunities and paid work experiences. There are better

working relationships among ASU departments with better coordination. ASU EMS is now better than ever; it is more legitimate and efficient, serving the university even better than before.

6.1. Future directions

There were severe limitations with this research study due to the lack of survey responses. A complete repeat of the survey with more participants would be helpful in order to understand how CBEMS organizations have continued to develop since the early 1990s. Another option is to use the self-reported information stored in the web-based NCEMSF database and track how CBEMS organizations have changed over the years.

REFERENCES

- Air & Surface Transport Nurses Association (U.S.). 2017. *ASTNA patient transport: principles and practice*.
- Apel, Otto F. M.D., and Pat Apel. 2001. *MASH An Army Surgeon in Korea*.
- Bell, Ryan Corbett. 2013. *The ambulance: a history*.
- Castiglioni, Arturo, and E. B. Krumbhaar. 2019. *A history of medicine*.
<http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=1982094>.
- Edgerly D. 2013. "Birth of EMS. The history of the paramedic". *JEMS : a Journal of Emergency Medical Services*. 38 (10): 46-8.
- Enrollment Trends - Metropolitan Campuses. Retrieved from
<https://facts.asu.edu/Pages/Enrollments/EnrollmentTrends.aspx>
- Fisher J., Ray A., Savett S.C., Milliron M.E., and Koenig G.J. 2006. "Collegiate-based emergency medical services (EMS): A survey of EMS systems on college campuses". *Prehospital and Disaster Medicine*. 21 (2): 91-96.
- "Iconic Moments in EMS: Recognizing the moments, people, technologies and ideas that shaped modern EMS.". 2017. *JEMS : a Journal of Emergency Medical Services*. 42 (3).
- Kelley RL. 2001. "The roots of EMS (getting back to your roots)". *Emergency Medical Services*. 30 (2).
- King BR, BS Zachariah, DC Cone, and P Clark. 1996. "A survey of emergency medical services systems on college and university campuses". *Prehospital and Disaster Medicine*. 11 (4).
- "Medical emergencies". 1978. *MD Medical Newsmagazine*. 22 (11): 101-13.
- McGaugh, Scott. 2015. *Surgeon in blue: Jonathan Letterman, the Civil War doctor who pioneered battlefield care*.
- McKillip, Jack, Carol Lynn Courtney, Richard Locasso, Patricia Eckert, and Fran Holly. 1990. "College Students' Use of Emergency Medical Services". *Journal of American College Health*. 38 (6): 289-292.
- Montgomery BJ. 1980. "A capsule history of US emergency medical care". *JAMA*. 243 (10).
- Mustalish AC. 1986. "Emergency medical services: twenty years of growth and development". *New York State Journal of Medicine*. 86 (8): 414-20.

National Academy of Sciences Staff. 2000. *Accidental Death and Disability: The Neglected Disease of Modern Society*. Washington: National Academies Press.
http://www.nap.edu/openbook.php?record_id=9978.

National Collegiate Emergency Medical Services Foundation. Retrieved from <https://www.ncemsf.org/>

National Registry of Emergency Medical Technicians. (n.d.). Information For The Public. Retrieved from <https://www.nremt.org/rwd/public/document/public-ems>

"Our History More Than a Century of Compassionate Service." American Red Cross History. Accessed March 30, 2019. <https://www.redcross.org/about-us/who-we-are/history.html>.

Page J. 1989. "A brief history of EMS.". *JEMS : a Journal of Emergency Medical Services*. 14 (8).

Robert E. Streicher. "Emergency Medical Services." *Health Services Reports* 89, no. 2 (1974). <http://www.jstor.org/stable/4594996>.

Robert E. Streicher. (1974). Emergency Medical Services. *Health Services Reports*, 89(2). Retrieved from <http://www.jstor.org.proxyiub.uits.iu.edu/stable/4594996Copy>

Shah, Manish N. 2006. "The Formation of the Emergency Medical Services System". *American Journal of Public Health*. 96 (3): 414-423.

Skandalakis, Panagiotis N., Panagiotis Lainas, Odyseas Zoras, John E. Skandalakis, and Petros Mirilas. 2006. "'To Afford the Wounded Speedy Assistance': Dominique Jean Larrey and Napoleon". *World Journal of Surgery*. 30 (8): 1392-1399.

The Bureau of Medicine and Surgery Navy Department. 1919. *United States naval medical bulletin*. Washington: U.S. Government Printing Office.

University history and milestones. Retrieved from <https://www.asu.edu/about/university-history-and-milestones>

What is EMS? Retrieved from <https://dchealth.dc.gov/service/what-ems>

Yolles TK. 1975. "Emergency medical service systems: a concept whose time has come". *Journal of Emergency Nursing: JEN : Official Publication of the Emergency Department Nurses Association*. 1 (4).